

## Article

# The Perceived Importance and Intended Purchasing Patterns of Sustainable Foods in Australian University Students

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**Abstract:** Although there has been considerable research on consumers' opinions about sustainable foods and purchasing behaviors, the experience of university students remains unclear. This study aims to characterize university students' perceptions of the importance of sustainable foods and determine the relationship between perceptions and the frequency of purchasing sustainable foods. In a non-random sample of university students, a cross-sectional, online survey determined students' perceptions of the importance of locally grown food and sustainable foods, and the self-reported frequency of purchasing sustainable foods. Multivariate binary logistic regression was conducted. Survey respondents ( $n = 1858$ ; 71% female; 80% domestic enrolled; 43% aged 18–24 years; 38% food insecure) perceived locally grown food (77%) and sustainable food (84%) as important, and 68% reported buying sustainable foods frequently. Students who purchased sustainable foods frequently were more likely to be female, older and food insecure, and also were significantly more likely to perceive sustainable foods as important (OR: 7.317; 95% CI: 5.538–9.667; SE: 0.142;  $p < 0.001$ ). Our results demonstrate that university students perceive sustainable foods as important and a relationship between perceptions and actions for purchasing sustainable foods is evident. Our results should inform the development of strategies within universities aligned with the United Nations Sustainable Development Goals, including improving access to locally grown and sustainable foods on campus to reflect student preferences, particularly for food insecure students.

**Keywords:** campus sustainable food; campus food environment; food choice; university students; college students; sustainable development goals

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## 1. Introduction

Countries around the world are challenged by growing population sizes, climate change, and globalized food systems, coupled with population health challenges, such as increasing levels of obesity and associated chronic diseases [1]. Therefore, sustainability in the food supply has become a critical issue impacting many actors across both public health and agriculture. The United Nations Brundtland Commission defined sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” [2]. Considering this definition, it is now widely recognized that currently the global food system is not sustainable [3]. Sustainable production of food is further threatened by general overconsumption, a reliance on consumption of foods with a large carbon footprint (e.g., animal protein, ultra-processed foods) and that a third of the food produced is either lost or wasted [3], which all contribute to environmental degradation. Currently, food systems account for approximately 30% of the world's energy consumption and more than 20% of total greenhouse gas emissions [4].

Sustainable diets and sustainable food systems have been well recognized as important features for the fulfilment of the United Nation's Sustainable Development Goals (UN SDGs) [5]. Sustainable diets are necessary to meet the proposed SDG targets of quality nutrition for all, in addition to environmental preservation [6]. For example, nutrition is the key focus for the SDG 2 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture', but sustainable nutrition is also an essential component within many of the other SDGs [6]. The concept of a sustainable diet has many definitions from varied perspectives, however, the common theme is sufficient production of nutritious food to support the health of current and future generations, while minimizing negative environmental impacts [7,8]. Thus, the sustainable diet concept considers nutritional aspects, in addition to environmental, economic, and social aspects [9], which reflects the close synergies between healthy consumption patterns, human health outcomes and minimizing negative environmental impact [6].

There are many features of sustainable diets, which comprise various dietary components that contribute different environmental impacts [9]. Increasingly, countries have started to incorporate sustainability considerations into their food policies and consumer education programs [9]. Such recommendations include consuming a mostly plant-based diet, reducing food waste and processed foods, and choosing seasonal and locally grown foods. These strategies reflect how food choices at an individual level culminate to create the overall food demand that directs food systems. Positively, consumers have identified that sustainable diets are highly associated with perceptions of both health and sustainable production [10]. Like other consumers, university students can support sustainability through food choices [11], and if students prioritize these food choices, universities have a clear responsibility to adapt to meet the needs of their students. The following literature review will identify the relevant published literature related to the perceived importance of sustainable foods and purchasing behaviors in university students, which has been used to inform the research questions and hypothesis for the present study.

### *1.1. University Students Perceptions of Sustainable Foods*

In previous research, younger, well-educated individuals have demonstrated better knowledge of aspects related to sustainability [10], and increasing educational attainment is consistently associated with sustainable food choices [12]. Sustainable food choices in this group have been shown to be influenced by friends, family and information resources including documentary films, books and university courses [13]. Perhaps because of this, university students, who are predominantly young adults, have shown to be more environmentally conscious than other groups, and they have also been shown to be willing to change their eating behaviors [14]. Interestingly, one study in the USA identified that university students who perceive that locally grown and sustainable foods are very important are more likely to have better diet quality, including higher consumption of fruits and vegetables [15]. Further, a small intervention study in the USA identified that after university students completed a course on sustainable food and food production that they consumed lower amounts of high-fat dairy, high-fat meat and confectionary foods [16]. As most university students are young adults, they are in a formative developmental period where lifelong dietary patterns are established, and therefore students who prioritize sustainable foods may have more positive long-term health outcomes [15].

Some research has suggested that among university students, perceptions of the importance of sustainable food changes according to the sustainable attributes of that food. For example, in one study in the USA, university students who identified as "committed consumers" towards sustainable food placed a high value on all attributes of sustainability, including organic status, however other students only favored sustainable foods from local and small-family farm systems [17]. Another study demonstrated that in Greek university students sustainable food consumption behavior is limited to eating seasonal fruits and vegetables and purchasing locally grown foods to minimize environmental impact [18]. Further characterization of student's perceptions of the importance of both locally grown

and food which minimizes environmental impacts, and the relationship with purchasing patterns of sustainable food in the Australian context may extend these results.

While there is increasing motivation and intention among young adults to act more sustainably, it must be recognized that university student's experiences are diverse, and the key demographic and educational characteristics of Australian university students who perceive sustainable food choices as important remains unknown. One Australian study has identified that most of the undergraduate students studying nutrition and dietetics surveyed reported that sustainable foods were important to them [19]. However, university students are clearly not a homogeneous group, and the perceptions of the importance of sustainable foods in Australian university students across a wider number of disciplines would build on this knowledge. One study in Italian university students did not demonstrate differences in attitudes towards sustainable foods by discipline of enrollment, however other factors such as age and living conditions did influence their perceptions [20]. The extent to which other demographic and education characteristics influence the attitudes and behaviors towards sustainable foods in Australian students also remains unclear. A more robust understanding of whether sustainable foods are seen as important in Australian university students and how their perceptions affect purchasing behaviors may further support widespread implementation of the UN SDGs within Australian universities. This could include strategies which improve access to sustainable food on campus, with both positive health and environmental impacts.

### *1.2. University Students Behaviors towards Purchasing Sustainable Foods*

A recent systematic review identified a small group of studies, of varying quality, that investigated sustainable food behaviors and purchasing patterns in university student populations internationally, showing the consumption of seasonal and local foods was the main behavior used towards sustainable food consumption in this group [12]. The proportion of students consuming sustainable foods also varied by study [12]. However, the review highlighted that research in the Australian context was scant. As more than 40% of Australians aged 20–34 have an undergraduate degree from a university or another tertiary institution [21], there is a large potential positive impact associated with understanding and improving sustainable purchasing and consumption behaviors within this group, both now and as the students continue to age and shape future food systems through sustainable behaviors and advocacy efforts.

When it comes to making sustainable dietary choices, broad consumer research has shown that perceptions and intentions are not always translated into actual purchasing and consumption behaviors. While some studies have demonstrated a link between positive attitudes and reported purchase behaviors, other research has demonstrated an attitude–behavior gap when it comes to purchasing sustainable foods [22]. In particular, the availability of sustainable food choices and the perceived effectiveness of individual actions have been shown to be key factors influencing consumers transition from intention to action [23]. One study in an Australian university identified that the major barrier limiting students purchasing of sustainable food is the price of food on campus and the cost of sustainability initiatives [24]. Another Australian study identified that most university students were dissatisfied with the availability of sustainable food for purchase on campus [25]. While one study has shown that university students who reported having a positive attitude toward sustainable agriculture were significantly more likely to purchase locally grown and sustainable foods [26], international research has demonstrated a series of more complex factors influencing purchasing of sustainable food including that's students report they have limited time to cook and prepare food, and that junk foods were quicker to access [18]. Further, cultural background has shown to influence the consumption of locally grown food in students even when they live abroad [27]. In line with an increasing commitment to the UN SDGs, many universities in Australia and internationally are enacting sustainable purchasing guidelines and procurement goals in food services to support health and minimize the negative environmental impact of food on

campus [28]. However, ensuring these choices are available and affordable to all students on campus, may further support the adoption of sustainable behaviors in this group. An understanding of how student's perceptions of the importance of sustainable food is linked to purchasing behaviors in Australian university students will be key to informing targeted strategies in universities.

### 1.3. Research Questions, Hypothesis and Knowledge Gaps

Although some research exists on the university students' perceptions of sustainable food choices and purchasing behaviors, studies in Australian university students are still limited. To the authors' knowledge, no research on attitudes of sustainable foods and their purchasing patterns has been conducted in a diverse sample of Australian university students. Therefore, the following research questions this cross-sectional study aimed to answer were:

1. What are the demographic and education characteristics of Australian university students who perceive sustainable foods are important?
2. What are the demographic and education characteristics of Australian university students who purchase sustainable foods frequently?
3. What is the relationship between Australian university students' perceptions of the importance of sustainable foods and the frequency of purchasing sustainable foods?

The main hypothesis of this research is that discrete groups of students with different perceptions of the importance of sustainable food and purchasing behavior will exist, and a relationship between intentions and actions for sustainable foods will be present.

While research in an international context has widely investigated how consumers perceive the importance of sustainable foods, and the frequency with which consumers purchase these foods, this study fills notable gaps in the literature as it:

- Focusses on a diverse group of Australian university students, which are a group who have been understudied in research of sustainable consumption behaviors.
- Characterizes the demographic and educational characteristics of university students who think sustainable foods are important which can be used to develop initiatives that match students' interest in making sustainable food choices, in addition to identifying the groups where there are opportunities to improve their sustainable behaviors.

## 2. Materials and Methods

### 2.1. Study Setting and Participants

University of Tasmania (UTAS) is a tertiary education institution with UTAS and has campuses in Hobart, Launceston and Burnie, and a campus in Sydney, New South Wales. UTAS is committed to implementing the UN SDGs [5,28]. UTAS's commitment to a sustainable food culture on campus are reflected in the university's Strategic Framework for Sustainability 2019–2024 [29]. Strategies to develop a sustainable food culture focus on promoting environmentally and socially positive practices and products, minimizing packaging use and ensuring what is used has low negative environmental impact. Additionally, UTAS prioritizes working with local food partners to increase the demand and supply of seasonal, local and organic food.

UTAS conducts a sustainability survey biennially to investigate perceptions of sustainability in students' lives and the sustainability performance of the university. A report of the overall findings of the survey have been published online [30]. The 2020 UTAS Student Sustainability Survey was the third sustainability survey at UTAS and all enrolled UTAS students ( $n = 31,143$ ) were eligible to participate through the completion of an online survey. UTAS enrolled students are estimated to make up more than 5% of the wider Tasmanian population, and they are similar in many demographics to all Australian higher education enrolled student population in 2019, with the exception that UTAS has less international enrolled students (22%) than universities nationally (32.4%) [31].



## 2.2. Questionnaire Development

The UTAS Student Sustainability Survey was developed to measure student perceptions, aspirations, and behaviors on sustainability in general and on the sustainability performance of the university. The purpose of the survey was to identify areas of strengths and opportunity for UTAS initiatives to improve sustainability as they pursue the UN SDGs. The survey defined sustainability according to the Brundtland Commission Report (see introduction for definition and Appendix A [2]), and provided links to the University of Tasmania Strategic Framework for Sustainability, and the current vision and mission statements of the university. The survey included questions to explore student perceptions of the importance of sustainable and locally grown food choices, in addition to the self-reported frequency with which students are able to purchase these foods, which were used in this study (Appendix A). The following statement was provided to students about what constitutes sustainable food to guide their answers on questions: “Sustainable food is food that is healthy and produced in a humane, environmentally friendly, socially responsible and economically fair way”. Locally grown foods have been identified as one concept contributing towards sustainable food consumption due to their role in reducing food miles [12], and have been identified as a major contributing factor to sustainable foods for university students in the literature review (Sections 1.1 and 1.2). For the purpose of this survey, locally grown foods were defined as foods grown within Tasmania. This definition was informed by the criteria that Tasmania is an island state which produces a wide variety of foods (fruits, vegetables, meat, dairy foods and wine) for local markets [32], and foods grown within Tasmania would avoid being transported long distances on freight ships or planes. Within Tasmania, there is a growing movement towards locally grown foods and strengthening local food systems. Tasmanian consumers perceive that such strategies contribute to sustainable and resilient food systems [33].

The developed survey related to the goals of the stakeholders of the survey. Following a literature review indicating an absence of validated tools for this purpose, expert members of the research team collaborated to develop a series of brief questions to inform policies and programs on campus to contribute to reaching the UN SDG. The questions were reviewed for relevance and face validity by student members of the UTAS sustainability committee, and questions were amended based on their feedback. Specifically, this study presents an analysis of questions from the larger survey which asked students to rate their perceptions of the importance of purchasing locally grown food and food which minimizes environmental impact, and the relationship with the frequency with which they bought these foods. Responses to the level of agreement to each statement were defined along a 10-point Likert scale from 10 (very important) to 1 (very unimportant). One question asked students about their ability to make food choices that minimize their environmental impact, with six response options (never, rarely, occasionally, often, very often and always). Food security status was determined using a single-item question, which a widely used, validated food security question: “Over the past 12 months, have you ever run out of food and couldn’t afford to buy more?” with the six response options (never, rarely, occasionally, often, very often and always). Additionally, five sociodemographic questions included age, gender, level of study, mode of study, enrolment type and college of enrollment.

## 2.3. Data Collection

A cross-sectional study using an online survey was conducted in early March 2020. Participants were recruited using an email invitation which was sent to all enrolled UTAS students to participate in the survey. In addition to the email, the survey was promoted through university newsletters and through the social media of various UTAS societies and student clubs. The survey was administered through the online survey platform SurveyMonkey and was open for 2 weeks. Upon opening the survey link, all potential participants were provided with a participant information sheet and gave their informed consent before beginning the survey. The study was conducted in accordance with the

Declaration of Helsinki, and approval for this survey was granted by the UTAS Social Sciences Human Research Ethics Committee (H0015525).

#### 2.4. Data Analysis

All collected data were exported from the online survey platform into IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp. Armonk, NY, USA), where it was prepared for statistical analysis. All available survey data was used in the analyses. The significance level for all analyses was set at 0.05.

The categories for some of the sociodemographic variables were collapsed due to low counts. Age was collapsed from 7 categories to 5 due to low numbers in the oldest 3 age groups ('55 to 64', '65 to 74' and '75 or older' were grouped in '55 and over'). The two variables assessing their perceptions of the importance of making food choices that minimize environmental impact and the importance of locally grown foods were recoded into binary variables by combining the responses into 'important' (responses from 10 to 6) and 'unimportant' (responses from 5 to 1). In addition, the self-reported frequency with which students made food choices that minimize their environmental impact was recoded into a binary variable by collapsing the most frequent responses (always, very often, often) and the less frequent responses (occasionally, rarely, never) as 'frequently' and 'infrequently' respectively. Food security status was coded as "food secure"—never run out of food, or "food insecure"—had run out of food over the previous 12 months.

All sociodemographic variables were either nominal or ordinal and were summarized as proportions and frequencies. The relationship between the scale questions of the importance of food which minimizes environmental impact and locally grown food was determined using Pearson correlation coefficients. To answer the research questions, univariate logistic regression was used to compare student perceptions of the importance of purchasing locally grown food and food that minimizes environmental impact, and frequency of purchasing food to minimize environmental impact according to sociodemographic characteristics. This analysis identified the demographic and education characteristics of the students who thought sustainable food are important and purchased them frequently. A multivariable logistic regression was performed for each outcome variables, including all education and demographic variables to yield adjusted odds ratios as there are likely correlations within the demographic variables related to the assessed outcomes. The combination of univariate and multivariate analyses assists our interpretation of the contribution of each demographic and education characteristic of students who thought sustainable food are important and purchased them frequently.

Binary logistic regression evaluated the association between students' perceptions of the importance of purchasing locally grown food and food the minimizes environmental impact against the frequency of purchasing food to minimize environmental impact. The dependent variables were the log odds of the binary variable "importance" with the independent variable "frequency of purchasing". Results are reported as odds ratios.

The dependent variables were the log odds of the binary variables assessing "importance" (of purchasing food that minimizes environmental impact and purchasing locally grown food as separate analyses) with the independent variable a potential demographic covariate. Results are reported as odds ratios. The analyses took the form:

$$\text{logit}Y(\text{Importance}) = \ln\left(\frac{\hat{Y}}{1 - \hat{Y}}\right) = a + bX \quad (1)$$

For example,  $X = \text{gender}$ .

Similarly food purchasing assessed the binary dependent variable "frequency of purchasing".

$$\text{logit}Y(\text{Frequency}) = \ln\left(\frac{\hat{Y}}{1 - \hat{Y}}\right) = a + bX \quad (2)$$

For the multivariate models, the covariates were all variables which had  $p < 0.1$  for the univariate analyses.

$$\text{logit}Y = \ln\left(\frac{\hat{Y}}{1 - \hat{Y}}\right) = a + bX_1 + cX_2 + \dots \quad (3)$$

Intermediate models proceeded in a backwards procedure with variables removed by order of significance until the model contained only variables with  $p < 0.1$  (for any level). Interaction terms between covariates were not considered in the model.

### 3. Results

Key demographic and education characteristics of the student respondents (Table 1) indicates that the most common age group for students was 18–24 years (43%), most identified as female (71%) and were enrolled as domestic (80%), undergraduate (71%), on-campus students (66%). Over a third (38%) were classified as food insecure.

**Table 1.** Sociodemographic characteristics of the sample of university student respondents ( $n = 1858$ ).

Characteristic	Category	<i>n</i> (%)
Age ( $n = 1852$ )	18 to 24	787 (42.5)
	25 to 34	476 (25.7)
	35 to 44	234 (12.6)
	45 to 54	168 (9.1)
	55 and over	187 (10.1)
Gender ( $n = 1822$ )	Female	1301 (71.4)
	Male	521 (28.6)
Level of study ( $n = 1847$ )	1st year	690 (37.4)
	2nd year	321 (17.4)
	3rd year	186 (10.1)
	4th year	111 (6.0)
	Postgraduate	539 (29.2)
Mode of study ( $n = 1848$ )	Distance	629 (34.0)
	On-campus	1219 (66.0)
Enrolment ( $n = 1851$ )	Domestic student	1479 (79.9)
	International student	372 (20.1)
Food security status ( $n = 1514$ )	Food Secure	937 (61.9)
	Food Insecure	577 (38.1)

#### 3.1. Importance of Purchasing Food to Minimize Environmental Impact

Overall, most student respondents (77%) perceived that it was important to purchase food to minimize environmental impact. Table 2 presents crude and adjusted odds ratios of their perceptions of the importance of purchasing food to minimize environmental impact for the sociodemographic variables considered. In the multivariate analysis, enrolment type and food security status was non-significant and not entered into the final model. The final adjusted model had Cox–Sneel Pseudo  $R^2 = 0.033$ , likelihood ratio test statistics  $\chi^2 = 1389.6$ , and  $p < 0.0001$ . In the univariate analysis, female students were 70% more likely to report that it was important to purchase food to minimize negative environmental impact compared with male students, which remained significant in the multivariate model. Additionally, in the multivariate model, on campus students were 40% more likely to report it was important to purchase food to minimize environmental impact compared with distance enrolled students.

**Table 2.** Association between sociodemographic characteristics and university students perceived importance of purchasing food to minimize environmental impact.

Perceived Importance of Purchasing Food to Minimize Environmental Impact											
		Important <i>n</i> (%)	Unimportant <i>n</i> (%)	Odds Ratio	95% CI	SE	<i>p</i> -Value	Adjusted Odds Ratio	95% CI	SE	<i>p</i> -Value
Age	18 to 24	447 (75.1)	148 (24.9)	-	-	-	-	-	-	-	-
	25 to 34	273 (77.1)	81 (22.9)	1.116	[0.819–1.521]	0.158	0.488	1.176	[0.835–1.657]	0.175	0.354
	35 to 44	122 (75.3)	40 (24.7)	1.010	[0.675–1.510]	0.205	0.962	1.170	[0.750–1.825]	0.227	0.489
	45 to 54	91 (82.7)	19 (17.3)	1.586	[0.935–2.689]	0.269	0.087	1.704	[0.958–3.032]	0.294	0.070
	55 and over	87 (79.1)	23 (20.9)	1.252	[0.763–2.056]	0.253	0.374	1.453	[0.841–2.511]	0.279	0.181
Gender	Female	727 (79.3)	190 (20.7)	1.701	[1.301–2.223]	0.137	<0.001	1.735	[1.318–2.285]	0.140	<0.001
	Male	270 (69.2)	120 (30.8)	-	-	-	-	-	-	-	-
Level of study	1st year	363 (76.9)	109 (23.1)	-	-	-	-	-	-	-	-
	2nd year	172 (70.2)	73 (29.8)	0.707	[0.500–1.002]	0.177	0.051	0.707	[0.495–1.009]	0.182	0.056
	3rd year	114 (82.0)	25 (18.0)	1.369	[0.845–2.219]	0.246	0.202	1.391	[0.847–2.281]	0.253	0.192
	4th year	66 (74.2)	23 (25.8)	0.862	[0.512–1.450]	0.266	0.575	0.921	[0.542–1.565]	0.271	0.760
	Postgraduate	363 (76.9)	109 (23.1)	1.095	[0.791–1.515]	0.166	0.584	1.012	[0.713–1.437]	0.179	0.946
Mode of study	Distance	278 (75.7)	89 (24.3)	-	-	-	-	-	-	-	-
	On-campus	738 (77.0)	221 (23.0)	1.069	[0.806–1.417]	1.069	0.806	1.410	[1.009–1.971]	1.410	0.044
Enrolment	Domestic	808 (77.0)	242 (23.0)	-	-	-	-	-	-	-	-
	International	211 (75.6)	68 (24.4)	0.929	[0.682–1.266]	0.158	0.642	-	-	-	-
Food Security	Food Secure	623 (76.5)	191 (23.5)	-	-	-	-	-	-	-	-
	Food Insecure	398 (76.5)	122 (23.5)	1.00	[0.771–1.297]	0.132	0.999	-	-	-	-
Total		1021 (76.5)	313 (23.5)								

### 3.2. Importance of Purchasing Locally Grown Food

The majority of student respondents reported it was important to purchase locally grown food (84%). Table 3 presents crude and adjusted odds ratios of students' perceptions of the importance of purchasing locally grown food for the variables considered. Food security status was not significantly associated in the univariate model and was excluded. Further, while in the univariate model, age and level of study were significantly associated with the outcome, these variables became non-significant in the initial multivariate model and both were excluded from the final adjusted model, which had Cox–Sneel Pseudo  $R^2 = 0.031$ , likelihood ratio test statistics,  $\chi^2 = 1103.1$ , and  $p < 0.0001$ . Female student respondents were 50% more likely to report it was important to purchase locally grown food compared to male student respondents. Additionally, on-campus student respondents were 70% more likely to report it was important to purchase locally grown food compared to distance-enrolled student respondents. Lastly, international student respondents were approximately 50% less likely to report it was important to purchase locally grown food than domestic student respondents.

**Table 3.** Association between sociodemographic characteristics and university students perceived importance of purchasing locally grown food.

		Perceived Importance of Purchasing Locally Grown Food									
		Important <i>n</i> (%)	Unimportant <i>n</i> (%)	Odds Ratio	95% CI	SE	<i>p</i> -Value	Adjusted Odds Ratio	95% CI	SE	<i>p</i> -Value
Age	18 to 24	514 (86.2)	82 (13.8)	-	-	-	-	-	-	-	-
	25 to 34	279 (79.7)	71 (20.3)	0.627	[0.442–0.889]	0.178	0.009	-	-	-	-
	35 to 44	127 (80.4)	31 (19.6)	0.654	[0.414–0.032]	0.233	0.068	-	-	-	-
	45 to 54	91 (88.3)	12 (11.7)	1.210	[0.634–2.307]	0.329	0.563	-	-	-	-
	55 and over	81 (82.7)	17 (17.3)	0.760	[0.429–1.347]	0.292	0.348	-	-	-	-
Gender	Female	762 (85.6)	128 (14.4)	1.531	[1.124–0.086]	0.158	0.007	1.567	[1.141–0.152]	0.162	0.005
	Male	311 (79.5)	80 (20.5)	-	-	-	-	-	-	-	-
Level of study	1st year	389 (85.9)	64 (14.1)	-	-	-	-	-	-	-	-
	2nd year	201 (83.8)	39 (16.3)	0.848	[0.550–0.307]	0.221	0.455	-	-	-	-
	3rd year	118 (86.1)	19 (13.9)	1.022	[0.588–1.774]	0.282	0.939	-	-	-	-
	4th year	77 (83.7)	15 (16.3)	0.845	[0.457–1.559]	0.313	0.589	-	-	-	-
	Postgraduate	302 (23.2)	76 (5.8)	0.654	[0.454–0.942]	0.186	0.022	-	-	-	-
Mode of study	Distance	276 (80.9)	65 (19.1)	-	-	-	-	-	-	-	-
	On-campus	812 (84.7)	147 (15.3)	1.301	[0.942–1.796]	0.164	0.110	1.767	[1.242–2.514]	0.180	0.002
Enrolment	Domestic	879 (85.4)	150 (14.6)	-	-	-	-	-	-	-	-
	International	212 (77.4)	62 (22.6)	0.584	[0.419–0.813]	0.169	0.001	0.538	[0.374–0.776]	0.186	0.001
Food Security	Food Secure	665 (83.2)	134 (16.8)	-	-	-	-	-	-	-	-
	Food Insecure	429 (84.3)	80 (15.7)	1.081	[0.799–1.462]	0.154	0.615	-	-	-	-
Total		1094(83.6)	11.5(16.4)								

The correlation between the two questions of the importance of purchasing food to minimize environmental impact and locally grown food was  $r = 0.404$  ( $p < 0.001$ ), indicating differentiation between the questions.

### 3.3. Frequency of Purchasing Food to Minimize Environmental Impact

Over two-thirds of all student respondents (68%) reported they frequently purchased foods which minimized environmental impact. Table 4 presents crude and adjusted odds ratios for the frequency of purchasing food to minimize environmental impact for the variables considered. In the univariate model, level of study and enrolment type were not significantly associated with the outcome and were excluded from the initial multivariate model. Additionally, mode of study was significant in the univariate model but became non-significant in the initial multivariate model and was therefore excluded from the final adjusted model, which had Cox–Sneel Pseudo  $R^2 = 0.051$ , likelihood ratio test statistics,  $\chi^2 = 1801.2$ , and  $p < 0.0001$ . In the final model, increasing age was associated with higher reported frequency of purchasing food to minimize environmental impact (Table 4). For example, student respondents in the oldest age group (55+ years) were approximately twice as likely to report purchasing these foods frequently when compared with student respondents in the youngest age group (18–24 years). In addition, female



student respondents were nearly twice as likely to report frequently purchasing food to minimize environmental impact compared with male student respondents (Table 4). Lastly, food insecure students were 60% more likely to report purchasing these foods frequently compared to food secure students.

**Table 4.** Association between sociodemographic characteristics and university students and frequency of purchasing food that minimizes environmental impact.

		Frequency of Purchasing Food to Minimize Environmental Impact									
		Frequently Purchased * n (%)	Infrequently Purchased * n (%)	Odds Ratio	95% CI	SE	p-Value	Adjusted Odds Ratio	95% CI	SE	p-Value
Age	18 to 24	391 (61.8)	242 (38.2)	-	-	-	-	-	-	-	-
	25 to 34	278 (70.0)	119 (30.0)	1.446	[1.106–1.890]	0.137	0.007	1.451	[1.102–1.911]	0.140	0.008
	35 to 44	145 (75.5)	47 (24.5)	1.909	[1.324–2.753]	0.187	0.001	1.915	[1.320–2.780]	0.189	0.001
	45 to 54	103 (74.6)	35 (25.4)	1.821	[1.202–2.760]	0.212	0.005	1.948	[1.266–2.999]	0.219	0.002
	55 and over	115 (76.7)	35 (23.3)	2.034	[1.348–3.067]	0.210	0.001	2.113	[1.391–3.212]	0.212	0.000
Gender	Female	770 (72.6)	291 (27.4)	1.963	[1.552–2.482]	0.120	<0.001	1.928	[1.518–2.448]	0.122	<0.001
	Male	244 (57.4)	181 (42.6)	-	-	-	-	-	-	-	-
Level of study	1st year	386 (69.2)	172 (30.8)	-	-	-	-	-	-	-	-
	2nd year	169 (62.4)	102 (37.6)	0.738	[0.545–1.001]	0.738	0.545	-	-	-	-
	3rd year	101 (67.8)	48 (32.2)	0.938	[0.636–1.382]	0.938	0.636	-	-	-	-
	4th year	57 (61.3)	36 (38.7)	0.706	[0.448–1.111]	0.706	0.448	-	-	-	-
	Postgraduate	315 (72.6)	119 (27.4)	1.180	[0.894–1.556]	1.180	0.894	-	-	-	-
Mode of study	Distance	365 (74.3)	126 (25.7)	-	-	-	-	-	-	-	-
	On-campus	664 (65.5)	350 (34.5)	0.655	[0.515–0.833]	0.123	0.001	-	-	-	-
Enrolment	Domestic	836 (68.9)	377 (31.1)	-	-	-	-	-	-	-	-
	International	197 (66.6)	99 (33.4)	0.897	[0.685–1.176]	0.138	0.432	-	-	-	-
Food Security	Food Secure	607 (64.8)	330 (35.2)	-	-	-	-	-	-	-	-
	Food Insecure	428 (74.2)	149 (25.8)	1.562	[1.241–1.965]	0.117	<0.001	1.631	[1.285–2.070]	0.122	<0.001
Total		1035 (68.4)	479 (31.6)								

\* ‘Frequently purchased’ includes Likert response options Always, Very Often and Often and ‘Infrequently purchased’ includes Likert response options Occasionally, Rarely and Never.

### 3.4. Relationship between Perceptions and Purchasing Behaviour

There was a strong, significant relationship between students’ perceptions of the importance of purchasing food to minimize environmental impact and the frequency of purchasing food to minimize environmental impact. Student respondents who reported it was important to purchase these foods were more than seven times more likely to purchase these foods frequently (OR: 7.317; 95% CI: 5.538–9.667; SE: 0.142;  $p < 0.001$ ). Additionally, student respondents who perceived it was important to purchase locally grown foods were two and a half times more likely to frequently purchase foods that minimize environmental impact (OR: 2.486; 95% CI: 1.845–3.350; SE: 0.152;  $p < 0.001$ ).

## 4. Discussion

This study presents results from a cross-sectional, online survey of Australian university students’ perceptions of sustainable food, how frequently they purchase them and the relationship between intentions and actions for purchasing sustainable foods. Our results indicate that most university students perceive locally grown foods and foods which minimize environmental impact as important. Students who purchase these foods frequently are more likely to be female, older and classified as food insecure, and they are significantly more likely to perceive these foods as important. These data indicate that most Australian university students in our sample have positive attitudes towards sustainable dietary practices and are likely to purchase these foods where possible. This finding should support positive changes to university food environments, through the provision of healthy, sustainable food choices, particularly for food insecure students who are especially vulnerable to poor health and educational outcomes. Additionally, our findings could inform strategies that target students who are less likely to think that sustainable foods are important, and who may not intentionally purchase them frequently (e.g., younger and male students). While personal beliefs have shown to influence intention to purchase sustainable foods in international literature [34], our results contrast with some other Australian research. For

example, a qualitative study in the general Australian population suggested that consumer eating behaviors are less than ideal in terms of their environmental sustainability due to a general lack of knowledge and awareness [11]. Furthermore, a cross-sectional survey indicated while most Australian consumers (70%) support sustainable diets, only 10% are actively consuming a diet that prioritizes sustainability [35].

To what extent does the university food environment influence students' attitudes and purchasing behaviors related to sustainable foods? Recently published research indicates that only a minority of university students are satisfied with the availability of sustainable food (37%) and locally grown food (33%) options on campus [25]. Underscoring this, a recent review of governance documents across universities has highlighted that there is substantial scope for universities to prioritize sustainable food systems [36]. Indeed, our findings indicate that students would support initiatives for increasing sustainable foods on campus. Universities are uniquely placed to demonstrate leadership in supporting healthy and sustainable food systems [37] and most university students (91%) have been shown to agree that their place of study should actively incorporate and promote sustainable development [38]. Our study findings also indicate a strong willingness to translate perceptions of sustainability into purchasing patterns for students, providing further justification and support for programs and policies that promote sustainable food systems on campus.

Many universities, including UTAS, have demonstrated commitment to integrating sustainability practices related to food into both campus development and day-to-day operations [28]. The results of our study indicate that the aspirations of both universities and university students related to sustainable and locally grown foods are matching, but also highlights that universities could do more to support action, including increasing the availability of these food choices on campus. In our study, students who were enrolled to attend classes on campus were significantly more likely to agree that locally grown and sustainable food was important compared with distance enrolled students. However, there was no difference in the frequency with which on campus students purchased these foods compared with distance enrolled students. This finding, coupled with previous research showing that many students are dissatisfied with food options on campus [25] may indicate that university outlets should improve and promote healthy, sustainable or locally grown options for students to purchase while on campus. To determine the scope for improvement, a formal evaluation of the on-campus food environment should be a priority. Previous research has shown that point-of-purchase actions, including marketing and food labelling, may partially contribute to improving the uptake of healthy and sustainable food alternatives [39]. Additionally, when sustainable information is included, consumers have been shown to pay a higher price [40], which has been also documented in a university student population [39]. While previous research has indicated that a sustainable diet is affordable in Australia [41], most university students have reported that they would be most likely to purchase sustainable food selections if they were incentivized using meal deals or rewards systems [42]. Such strategies would be particularly beneficial for food insecure students, who surprisingly, reported purchasing sustainable foods frequently in our study despite the reduction in food choices available to food insecure individuals.

Previous research has reported that consuming locally grown foods was the most commonly performed food-related environmental behavior [43], and in particular Australian consumers perceive regionally grown foods as very important for supporting the local economy [44]. Our findings extend these studies by demonstrating the positive attitude to locally grown food in an Australian university student population. The moderate correlation seen between the two variables which measured the importance of foods also indicates that students view locally grown food as a fairly distinct concept to food which minimizes environmental impact. Interestingly, our study showed that international students were significantly less likely to report that locally grown food is important to them, which may reflect cultural differences around locally grown food between countries in addition to different dietary practices and food needs. However, positive perceptions towards locally

grown food have been reported in international student populations from some countries including the USA [15] and Greece [18].

Our study identified that female students were significantly more likely to perceive sustainable foods as important and were twice as likely to report frequently buying these foods when compared to male students. Similar sociodemographic associations have been reported in other research, where females have been shown to possess a higher willingness to increase sustainability through their consumption behavior [45] and have been shown to be more ready to adopt a sustainable diet [46]. This has also been demonstrated in university student populations internationally [47]. A review of previous research exploring age differences in sustainable behaviors has found mixed results [48]. In our study, older students were twice as likely to frequently purchase sustainable foods compared to students in the youngest age group, which could relate to the youngest students living at home and not being responsible for household food purchases. Alternatively, older students may be more financially secure than younger students, meaning that sustainable foods may be more affordable for them, however, further research would be required to explore these factors.

### *Limitations*

While our findings are positive for how university students perceive sustainable foods, and provides the first evidence of perceptions of the importance of sustainable food and the relationship with purchasing patterns in Australian university students, this study must be considered in the context of some limitations. Firstly, the convenience sampling methods used limit the generalizability of the findings to all students at UTAS and the results may not be applicable in other university settings. However, given the similarities in demographic and education characteristics of university students across Australia, our findings could be broadly applicable to other universities. It is also possible that those with an interest in environmental issues are over-represented due to the nature and name of the survey. Female respondents were over-represented in our study compared to the general UTAS student population, which is common of surveys of this nature [15,49]. Further information about student's disciplines and course enrollment could further extend this analysis and identify opportunities to increase sustainability concepts into diverse courses. An additional limitation of the study the use of a non-validated questionnaire, which was developed in relation to the goals of the stakeholders of the survey. Future sustainability surveys at UTAS should consider the construct validity and reliability of the developed survey. Alternatively, adapting a pre-existing tool such as the questions about the importance of sustainable food from Project EAT [50] might be appropriate. It is possible that the wording of the questionnaire items may have elicited positive, socially desirable responses. Additionally, we did not differentiate whether students made sustainable food choices for health or environmental reasons, which should be explored in future studies. To extend these findings, future research may prioritize measuring actual purchase data as an objective assessment, rather than rely on self-reported behaviors. Lastly, the sociodemographic factors measured in our study only accounted for a small proportion of the variation in the responses (demonstrated by low Pseudo  $R^2$  values) and future research should to consider additional demographic factors that could influence perceptions and frequency of purchasing sustainable foods, such as income, housing, transportation, work and school schedules [51].

### **5. Conclusions**

Our findings demonstrate that the majority of surveyed Australian university students perceive that sustainable food is important. Students who purchase these foods frequently are more likely to be female, older and food insecure, and are significantly more likely to perceive these foods as important. Future research to extend the results of this study could include more objective measures of sustainable dietary practices and qualitative exploration of the main drivers of these behaviors. Additionally, measuring university

student interactions with the campus food environment could be important to indicate the extent to which sustainable food options on campus influence the diets of university students. Our results point to practical strategies to support students towards purchasing sustainable, healthy foods when on campus that are relevant for both UTAS and other universities in their attempt to fulfil the UN SDGs by 2030. To this end, UTAS has established a Sustainable Food Systems working group, which is overseen by the University's Sustainability Committee. Activities by this working group include integrating sustainability into governance policies and processes surrounding food procurement, an audit of the campus food environment, the development of student-led strategies to support sustainability, and providing support to existing sustainable food initiatives including the network of community gardens, cooking classes and local vegetable box schemes. Ongoing evaluation of the impact of these solutions towards increasing the adoption of sustainable diets on campus is important. Shifting towards healthy, sustainable diets across all university campuses will be an ongoing challenge requiring an interdisciplinary approach, and solutions must be integrated throughout multiple campus operations, and university activities such as teaching and research. Specifically, developing dedicated education programs across all disciplines and improving teaching to incorporate and prioritize sustainability may be an important consideration. Our findings highlight the potential for a positive response from university students to solutions towards supporting their sustainable, healthy food choices.

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**Informed Consent Statement:** Informed consent was obtained from all participants involved in the study.

**Data Availability Statement:** The data that support the findings of this study are available from the corresponding author, K.K., upon reasonable request.

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## Appendix A. Survey Instrument Used in the Study



### Student Sustainability Survey 2020

#### Your Views about Sustainability

To define sustainability the University refers to the Brundtland Commission Report (1987) which defined sustainability as "Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

The University's Strategic Framework for Sustainability (available from [www.utas.edu.au/sustainability](http://www.utas.edu.au/sustainability)) includes the following statements:

##### Sustainability Vision

"The University of Tasmania plays a vital role in leading our place-based and globally-connected communities in understanding and delivering sustainable futures."

##### Sustainability Mission

"Sustainability is essential to planetary health and human flourishing. Through our operations and academic activities, we have a vital role in facilitating sustainable forms of living. We uphold that sustainability is central to open and rigorous learning and knowledge creation that also recognises thousands of human generations of Tasmanian Aboriginal and other traditional knowledges and value systems. We are committed to embodying sustainable forms of production and consumption within the University and enable pathways towards a just and viable future. We commit to accountability and authenticity in our endeavours. We empower the University's students, staff and alumni to be facilitators in their fields and contribute to sustainable living now and into the future."

We hope that these statements may assist you as you make your way through this survey

**About You**

So that we may understand the differences in responses between various parts of the organisation, we ask you to answer a few quick questions about you and your work. Please be assured that all results will be analysed on a group basis and no individual responses will be identified.

1. Please specify your age:

- ☐ 18 to 24
- ☐ 25 to 34
- ☐ 35 to 44
- ☐ 45 to 54
- ☐ 55 to 64
- ☐ 65 to 74
- ☐ 75 or older

2. Please specify your gender:

- ☐ Female
- ☐ Male
- ☐ Prefer not to specify
- ☐ Other (please specify)

3. Which of the following best describes your level of study?

- ☐ 1st year
- ☐ 2nd year
- ☐ 3rd year
- ☐ 4th year
- ☐ postgraduate

5. Please specify your primary mode of study:

- ☐ On-campus
- ☐ Distance

6. At which campus is your primary place of study (choose one):

- ☐ Newnham
- ☐ Inveresk
- ☐ Sandy Bay
- ☐ Cradle Coast
- ☐ Sydney
- ☐ Hobart CBD
- ☐ Online / Distance
- ☐ Other (please specify)

7. Which best describes your enrolment?

- ☐ Domestic student
- ☐ International student



(Sustainable food working definition: is food that is healthy and produced in a humane, environmentally-friendly, socially responsible and economically fair way)

17. How important is it for you to make food purchasing choices which aim to minimise environmental impact?

1- Very unimportant                      5                      10 - Very important

18. How would you rate the importance of purchasing Tasmanian grown food?

1- Very unimportant                      5                      10 - Very important

Never              Rarely              Occasionally              Often              Very often              Always

In the last 12 months was there a time you ran out of food and were unable to purchase more?

I make food purchasing choices which aim to minimise environmental impact

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